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QUESTIONS

— ON —

THE STRUCTURE AND DEVELOPMENT

— OF —

THE HUMAN TEETH,

— AND —

SOME CLOSELY RELATED SUBJECTS,

FOR THE USE OF

DENTAL STUDENTS,

— BY —

CORYDON L. FORD, M. D., D. D. S.,

Prof. of Anatomy and Physiology in the Dental College of the University of Michigan.



ANN ARBOR, MICHIGAN:

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PREFACE TO FIRST EDITION.

In preparing the series of questions here printed, for the use of students in the Dental College, or any others desiring a knowledge of these important subjects, I am actuated by a conviction that the average student will acquire the desired information more rapidly, and that it will be more definite, than if he pursue the ordinary course.

The time and facilities allowed me for this work have not permitted me, by any means, to exhaust the subjects on which he should possess information; but I hope the example set, of definiteness of aim, will influence his further search after truth, and thereby contribute to the qualifications which shall aid him worthily to enter a useful and honorable department of the great healing art.

If asked why I have not furnished answers to these questions, I reply: I intend to do so in the Lecture Room. And besides, it is no part of my aim to supersede careful reading, but on the contrary to encourage it, by suggesting subjects on which light may be needed; and I would enlarge rather than abridge the course of study, and greatly regret that time and facilities do not allow us to investigate the comparative anatomy of teeth far beyond the few questions that I have raised,

for the very act of comparing teeth adds clearness and definiteness to the knowledge of our own.

I advise that, so far as possible, every student shall seek to verify, by his own observation, the truth of statements made, fully assured that by this means, the knowledge thus acquired, becomes more completely a part of his permanent information.

If I have raised questions to which, in some cases, a concise and satisfactory answer cannot be given, I direct attention, awaken thought, and, in due time, further investigation, till doubtful questions are settled by more successful research.

I have incorporated a few questions on topics intimately associated with teeth, and believe they will be found serviceable to the student.

The result, to those who have used my "QUESTIONS ON ANATOMY," justifies the belief that this hastily prepared manual—notwithstanding deficiencies—will, if carefully used in connection with good text-books, greatly promote an acquaintance with Anatomy and Physiology—which precede Pathology, as Pathology precedes the wise adoption of appropriate remedies.

I therefore here present for use these aids to, and not substitutes for, industry.

C. L. FORD.

UNIVERSITY OF MICHIGAN, }
DENTAL COLLEGE, }
Ann Arbor, Jan. 1, 1876. }



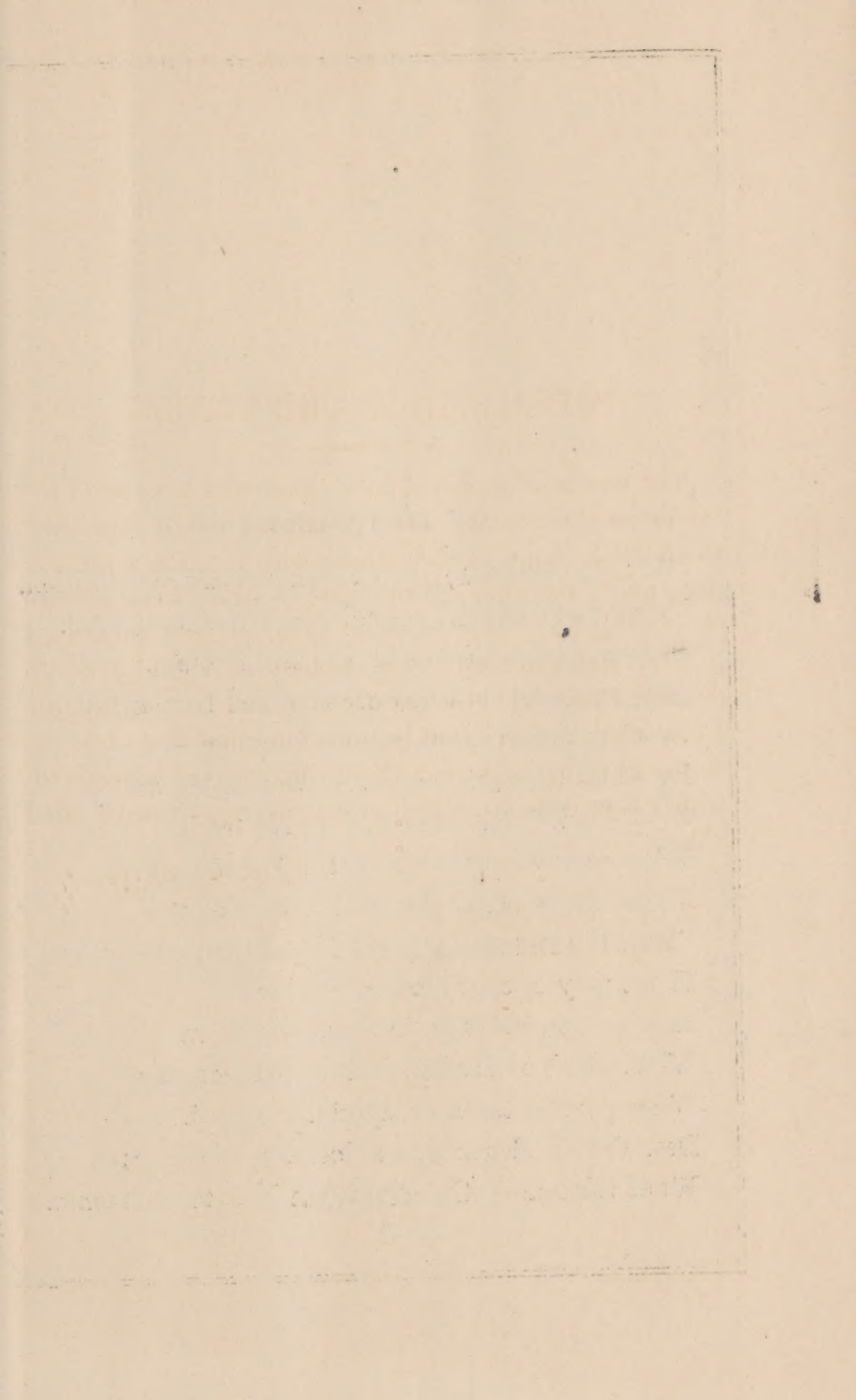
PREFACE TO SECOND EDITION.

The words of approval from those who have used the "Questions on Teeth," have prompted me to reproduce them with some modifications, and I am tempted to urge every member of the class to study to be sure of an intelligent answer to every question here presented.

I can not examine every student, as I gladly would do, and I present these questions as the best substitute I can offer, and ask that he question himself to become thoroughly familiar with the subjects here considered; which I promise to supplement, as opportunity shall allow.

C. L. FORD.

ANN ARBOR, MICH, }
May 7. 1884. }



OF THE TEETH.

What are **teeth**; give a comprehensive definition.

What is **teething**, and when first completed.

In what classes of animals are teeth found.

How many sets of teeth are supplied to man.

How many sets in the animal kingdom.

By what different names are the sets known.

Give the different names of human teeth.

What classes of teeth are in the **first set**.

What classes are in the second set of teeth.

Define the **meaning of the terms** employed.

How many of each class in each set.

In what general way do these sets differ.

Which teeth of an adult had no predecessors.

What parts of teeth are specially named.

Describe the character and location of each part.

What relation do the **crowns** bear to each other.

Will the **neck** of any tooth touch another neck.
Are the **roots** ever normally in contact.
In closing the jaws what **crowns** strike together.
Describe the relation of upper and lower molars.
What is the natural position of the **bicuspid**s.
What will be the position of the crown of incisors.
Do lower teeth ever project beyond the upper.
Which of the two jaws is the wider in man.
Why do the jaws of a horse vary in width.

THE ALVEOLAR PROCESS.

Where and what is the alveolar process.
What portion of an adult jaw does it make.
What structures form the **alveolar** process.
Describe it as seen in different sections of the jaw.
When is this process developed around the teeth.
What becomes of the process as the teeth are lost.
Describe the change on the loss of a single tooth.
In what way is the alveolar process removed.
In the forming stage is the tooth closely invested.
What membrane lines the **alveoli** in the jaw.
What kind of membrane envelops the root of teeth.
Can two distinct membranes be demonstrated.
How are teeth with conical roots retained in place.
How are molar teeth retained without the membrane.

OF INDIVIDUAL TEETH.

What are the different parts of each tooth.

Describe briefly the **crown** of a tooth.

Where and what is the **neck** of a tooth.

Does enamel cover the neck of a tooth.

Where are the **roots** of teeth situated.

What is attached to the neck of a tooth.

What envelops the roots of the teeth; how thick.

What is the character of the investing membrane.

Give the number of roots in the different teeth.

Describe carefully the crowns of the incisor teeth.

Describe carefully the crowns of the cuspidati.

Give the form of the root in incisors and cuspidati.

How do the roots of upper and lower bicuspid differ.

Describe the roots and positions of lower molars.

How are the roots of superior molars arranged.

Describe the location and shape of **pulp cavity**.

What kind of material occupies this cavity.

Of what tissues, or structures is it composed.

What is found on the **surface** of the pulp.

What and where are located **odontoblast cells**

What are Tomes' fibres and where are they found.

What structures pass through the root to the cavity

What is the shape of the canal in the roots of teeth.

VASCULAR SUPPLY OF TEETH.

Name the **two** principal arteries supplied to the face.

Trace carefully the branches of the **facial**.

Name fully the distribution of each branch given.

What is the origin of the internal maxillary artery.

Name and trace all the branches given off from it.

From what artery are branches supplied to the teeth.

How does the **dental artery** supply lower teeth.

What and where is the **dental canal**, how large.

What branches from the artery while in the canal.

Describe their course to, and into, the roots of the teeth.

What explanation of sometimes obstinate hemorrhage.

From what source are the **upper teeth** supplied.

In what way do the branches reach molar teeth.

From what source are incisors and cuspidati supplied.

What source of hemorrhage besides artery to the root.

From what source is the periosteum supplied.

Trace the vascular supply of each individual tooth.

Name all the branches from the external carotid.

Give branches and distribution of superior thyroid.

Trace the course and branches of the lingual a.

Describe the artery supplying the **side** of the **head**.

What arteries supply the soft palate and tonsils.

What artery supplies the contents of the orbit.

NERVEOUS SUPPLY OF TEETH.

What nerve supplies **sensation** for the face.

Describe the **fifth** cranial nerve in the skull.

Where is the **Casserian** ganglion located.

On what part of the nerve is it situated.

At what openings do the three branches pass.

Where does the first, or **ophthalmic** branch go.

Name and describe its principal branches.

What nerve supplies the forehead with sensation

Where does the **sup. maxillary** nerve end

What are the principal branches of this nerve.

From what source are the **upper teeth** supplied.

Describe the course of branches to the incisors.

Trace the course of branches to the molars.

What part of the **face** does the sup. max. supply.

Where does the **inferior max.** nerve pass out.

Name its principal branches for distribution.

Where does the **gustatory** nerve terminate.

What becomes of the **motor part** of this nerve.

Where is the auriculo-temporal n. distributed.

Trace the course of the **dental** branch.

In what way are the lower teeth supplied.

Where does a branch of it come out on the face,

How far upon the neck do its branches go.

How near the nerve are the roots of lower molars.
 Which one has its roots nearest the nerve.
 Why is the eruption of this tooth often painful.
 Where is the pain from that cause liable to be.
 Will the removal of sound teeth arrest the pain,
 What is the law of nerve influence in such cases.
 What ganglion of the sympathetic n. in the orbit.
 Where is the **ophthalmic** ganglion situated.
 What cranial nerves send branches to it.
 Where are nerves from the ganglion distributed.
 Is the **eye** ever affected by diseased teeth,
 Through what nerves does this result occur.
 Where is the ganglion of **Meekel** situated.
 With what nerves is it associated and how.
 Where is the **Otic** or **Arnold's** gang. situated.
 What is the location of **sub. maxillary** ganglion.
 To what system of nerves do these g. belong.
 Do they all receive branches from the fifth nerves.
 Does **paralysis** ever result from diseased teeth.
 Does **amaurosis** ever result from the same cause.
 Does **neuralgia** ever result from diseased teeth.
 Does it ever occur in parts remote from teeth.
 Is neuralgia in other nerves caused by teeth.
 From what source are the gums supplied with n.

THE STRUCTURE OF TEETH.

Of what different **structures** are teeth composed.

By what other names is **dentine** known.

What part of the tooth does dentine form.

Describe the structure of dentine.

What passages or **canals** exist in dentine.

What is the immediate investment of the tube.

What is dental sheath, or **sheath of Neumann**

What is between the dental tubuli, or canals.

Where and what is the inter-tubular substance.

How do the **tubuli** commence and terminate.

On what general plan are they arranged.

What is the size of dental tubuli? 1-4500 inch.

In what direction do they traverse dentine.

What relation do they bear to the cementum.

In what manner are these tubuli occupied.

What do you understand **Tomes' fibres** to be.

Where do they originate and how connected.

Does healthy dentine possess sensibility.

Is it sensitive if the pulp is destroyed.

Have nerve fibres been found in these canals.

What proportion of animal matter in d. 28.

What is the composition of its **mineral** part.

Is the proportion the same at all ages.

OF THE ENAMEL.

- What part of the tooth does the **enamel** form.
- What proportion of **animal** matter does it contain.
- How does this proportion vary in youth and age.
- What is the chemical composition of enamel.
- What structural elements does enamel show.
- What is the shape and size of enamel fibres. 1-5500.
- How are they arranged upon the dentine.
- Do canals exist in, or between the fibres of enamel.
- How is enamel united to the dentine? is union firm
- Does enamel possess any sensibility.
- Has it any power of repair from injury.

OF CEMENTUM.

- By what different names is **cementum** known.
- On what part of a tooth is it located.
- What other tissue of the body does it resemble.
- What spaces does the microscope reveal in it.
- Where is cementum thickest, and how thick.
- What and where is exostosis on teeth, when.
- Are **Haversian** canals found in Cementum.
- What important purpose does it serve for teeth.
- What and where is **Nasmyth's** membrane.
- What characteristic difference in cementum and bone.

ON THE STRUCTURE OF BONE.

In what class of animals is **bone** found.

What are the normal constituents of bone

How much and in what form is the animal matter.

What proportion of normal bone is earthy matter.

What is its composition on chemical analysis.

What two varieties of bone texture are recognized.

Where is the most perfect **cancellated** part found.

Where is the **compact** tissue best illustrated.

Describe the **investing membrane** of bone.

Where do vessels penetrate bone and where not.

What channels for conveying blood in bone.

How large are **Haversian** canals? how arranged.

How is bone arranged around these canals.

What constitutes an **Haversian rod** or **ossicle**.

What smaller spaces among the laminae of bone.

How large are **osseous lacunae**, how occupied.

How are they arranged with regard to canals.

What smaller channels does the microscope show.

What is the purpose of these minute channels.

Are these structures essential elements of bones.

Are the bones of birds and mammals alike in structure.

Have fishes' bones the structure of mammals.

Is bone found in the invertebrate animals.

DEVELOPMENT OF TEETH.

Where is observed the first preparation for teeth.

How early in embryonic life may it be seen.

What is first observed in the preparation.

With what membrane is it associated.

What is the nature of the observed **papillae**.

What is meant the **papillary stage** of Goodsir.

How many papillae appear in this stage.

Are these papillae in the epithelium, or below it.

What is observed surrounding the papillae.

What is the nature of the follicle and how formed.

What condition succeeds to **follicular stage**.

In what way is the **saccular stage** produced.

Describe the condition of matters in this stage.

Describe the successive changes to produce it.

What is the condition in a **four-month** embryo.

Is each papilla closed in at this stage.

What is meant by **primitive dental groove**.

What and where is **secondary dent. groove**.

For what purpose is this second groove formed.

What is the next change observed in papilla.

What shape does it assume before calcification.

Where does the process of calcification begin.

Describe the successive changes in the papillae.

Which tissue of a tooth is first formed.

Does the papilla enlarge after deposit of dentine.

What is the nature of the **dentine pulp**.

On what part of it is dentine first developed-

Describe the process till a thin shell is formed.

How soon does the formation begin in all.

FORMATION OF ENAMEL.

What element or tissue of the tooth appears next.

What is meant by **enamel pulp**, where located.

What is the general appearance of this organ.

Of what does it seem to be composed.

What relation does it bear the papillae.

Where does the enamel first appear and how look.

How far has dentine advanced when this begins.

Describe the growth of dentine to form crown.

Describe in like manner the formation of enamel.

Do these two tissues advance simultaneously.

On completion of enamel how is the dentine formed.

Where is the crown of the tooth during this time.

What is the condition of the jaw at this time.

Is the tooth there loosely or closely enveloped.

What is the relative vascularity of surrounding parts.

In what way is the tooth elongated as it rises.

How long does this development continue.



ON THE ERUPTION OF TEETH.

- What is the fourth stage of tooth development.
In what manner is the eruption accomplished.
What is the condition of the gum over coming teeth.
How is lancing a gum beneficial at this stage.
As the crown of an incisor appears, how is the root.
How early are the roots of incisor teeth completed.
At what age are the temporary molars complete.
Is the tooth firm in the socket on first appearance.
Describe the process of change till work is complete.
What becomes of the **papilla** as the tooth grows.
What remains of it in the fully formed tooth.
What element surrounds the tooth below the enamel.
Where is it thinnest and where the thickest.
At what time is the **cementum** formed.
What is the **cemental pulp** and where situated.
When is the eruption of the first set completed.
At what age is their development completed. 4 1-2
What classes of teeth does the first set contain.
What teeth succeed to the temporary molars.
Why are some teeth called **pre-molars**. Meaning.
Is the preservation of the temporary teeth important.
Is there an agreement among dentists here.
Does the late retention of temporary teeth work evil.

DEVELOPMENT OF PERMANENT TEETH.

How early is preparation made for permanent.

Where is process first observed in the embryo.

What is the first provision that can be discerned.

What is the **secondary dental** groove.

Where is it situated and how does it appear.

What is the next change that can be observed.

What change occurs in the position of these papillae.

What place do they finally occupy before birth.

Where are these rudiments at **two years** of age.

Where is the first permanent molar developed.

Where and how does the second one appear.

In what manner is the third molar produced.

At what time do these severally appear.

Are permanent teeth developed like temporary.

Is there any essential difference in the process.

How early in embryonic life does it begin.

How many teeth and rudiments at sixth year. 48.

What one has not yet commenced to form.

When does the eruptive stage commence.

At what age is it usually completed.

Are they fully consolidated at first appearance.

In what way are temporary teeth removed.

By what agency is this accomplished.

IMPORTANT COLLATERAL SUBJECTS.

BONES OF THE HEAD.

- What number of bones in the head.
- Into what groups are they divided.
- How many and what bones in the **cranium**.
- State, in general, the position of each bone.
- Which are single and which in pairs.
- Which one is supported by the atlas.
- How many angles and where located.
- What large opening in the **Occipital** bone.
- What smaller opening and where situated.
- With what bones does this articulate.
- Where are the **parietal** bones situated.
- With what bones does a parietal join.
- What bone in front of the parietal bones.
- What are its two chief divisions, where.
- What part of the orbit does the frontal form.
- What cavity within the frontal bone.
- Which is the smallest cranial bone.
- Where is it located, and what openings in it.
- Where is the sphenoid bone situated.
- Name four principal openings in it,
- How many wings and where situated,
- What nerves pass through this bone,

What is the other cranial bone and where.
Of what three portions is it made up.
Describe the location of each division.
In which part is the internal ear located.
What nerves pass through this bone. Where.
What **artery** passes through the temporal b.
What opening from the cranium behind it.
Where does venous blood leave the cranium.
Where does arterial blood enter it. Channels.

OF THE FACIAL BONES.

How many **facial** bones, and which single
Give the name and location of each.
What is the location and the shape of the orbit.
What bones form its superior boundary.
What bones on its inner, and outer sides.
What ones form its lower boundary shape.
What groove and canal in the lower wall.
Which bone has most interest for Dentists.
How many surfaces are named on it. Where.
What fossæ on the facial surface. Where.
What muscles arise from these fossæ. Use.
What foramen just below the orbit. Use.
What nerve passes there upon the face.
What vertical ridge on it and how caused.

Describe the **Zygomatic** surface of Sup. Max.
What openings on that surface, and for what use.
What name is given to its **superior** surface.
What and where is the **fourth** surface situated.
What part of the nasal boundary does it form.
What opening in this surface, and how large.
To what cavity does this opening lead.

OF THE MAXILLARY SINUS.

What is the autrum or maxillary sinus.
How large is that cavity? its general shape.
How thick is the bone surrounding it.
What is the appearance of its floor or bottom.
What relation has it to the roots of teeth.
Do the roots of teeth ever penetrate it.
How many teeth have roots near the sinus.
What kind of membrane lines this cavity.
What appears to be the purpose of the autrum.
Does this cavity exist at birth. How formed.
Is the nasal opening accessible for treatment.
If opened through tooth socket, which is nearest.
How many and what **processes** on this bone.
Where is the **nasal** process, and what join.
Where and what union with **malar** bone.
Where is the **palatine** process, and how shaped.



How much of the hard palate does it form.
 What foramen at the anterior part. How formed.
 What passes through it. In what direction.
 Why is this of interest to the Dentist. When.
 What bone completes the hard palate posteriorly.
 What is the **fourth** process of this bone.
 How much of the bone is properly so called.
 What position does the palate bone occupy.
 What nerve passes the posterior palate foramen.
 What part of the nasal boundary does it form.
 Where is the inferior **turbinated** bone located.
 Describe its shape, attachments and covering.
 What is meant by anterior and posterior **nares**.
 What structures surround the anterior nares.
 What is the form of posterior nares. How bounded.
 What bone forms the septum between them.
 Describe the shape and position of the vomer.
 What is meant by **meatus** of the nose.
 How many meati, and how are they bounded.
 What opening into lower meatus. Where.
 What opening into middle meatus. Where.
 What separates the superior meati. Size.
 What membrane lines all these surfaces.
 On what nerve does common sensation depend.

INFERIOR MAXILLARY BONE.

- What is the condition of this bone at birth.
- What different portions of this bone are named.
- Describe the condyle, and coronoid process.
- Where is the **angle** of the bone, and its form.
- What variation in the angle with age.
- What is the form of the body of the bone.
- What foramen on the body. Where located.
- What **canal** traversing the body of the bone.
- Where is the entrance to the dental canal.
- By what **structures** is the dental canal filled.
- What passes through the mental foramen.
- Name ten muscles attached to this bone.
- How much of the body is alveolar process.
- With what bone does it articulate. Where.
- What is the condition of inf. max. in the horse.
- What is its condition in the ox and sheep.
- What its condition in the dog, cat and pig.
- Where is the **hyoid** bone situated.
- What is its general shape in man.
- Of what five parts is it made, how united.
- What relation does it bear to the tongue.
- Name **eight** muscles connected with it.
- What peculiarity has it in some birds.

MUSCLES OF MASTICATION.

What are muscles of mastication. Name and number.
Describe the **temporal** muscle. Why so named.
Give its origin, insertion shape and action.

Describe in like manner the **masseter** muscle.
Give orig. inser. and action of **external** pterygoid.
Describe in like manner **internal pterygoid**.
How do the actions of these two muscles differ.

What important nerve passes between these muscles.

What **nerve** supplies these muscles of mastication
State the peculiarities of this part of the fifth nerve.

What muscle bounds the mouth laterally.

What salivary duct pierces the buccinator muscle.

By what nerves is this muscle supplied.

Is it properly a muscle of mastication.

Why is this of special interest to the Dentist.

State carefully all its attachments to bone.

Describe fully the **orbicularis oris** muscle.

By what vessels and nerves is it supplied.

Name three motions of the lower jaw in animals.

Which of these are illustrated in man.

What muscles secure the lateral motion.

By what ones is the antero-posterior motion made.

Which acts most vigorously to elevate it.

MOUTH AND ASSOCIATED PARTS.

Describe the extent of the **buccal** cavity.

What constitutes its posterior boundary.

What is the structure of the soft palate.

What muscles contribute to its formation.

Describe the levator-palati muscle. Where.

Describe carefully the tensor-palati muscle.

Where is situated the palato-glossus muscle.

Describe also the palato-pharyngeus muscle.

What is the structure and extent of the **uvula**.

Where is the alveolo-lingual groove. Shape.

What glands are located near its front part.

What salivary duct opens near the glands.

What nerve lies beneath the mucous membrane.

What muscles contribute to form the tongue.

Name and describe **five** of the muscles.

What nerves are distributed to the tongue.

What office is attributed to each of the three.

What varieties of papillae on the tongue.

By what vessels is the tongue supplied.

What kind of membrane lines the mouth.

What **epithelium** is found upon it. What is fur.

What glands are associated with it. Where.

Describe the gums on the alveolar process.

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OF SALIVARY GLANDS.

How w**many** salivary glands in man.
Which is the largest and where situated.
Describe carefully its location and extent,
Where is its deep portion situated. How deep.
What artery enters the gland at its lower part.
What three arteries pass from the gland. Where.
What veins associated with this gland. Where.
What nerve passes through the parotid gland.
Give the distribution and office of the nerve.
By what duct is its secretion conveyed away.
Where does the **duct of steno** terminate.
Which salivary gland is second in size.
Describe the location of the submaxillary gland.
What artery passes through this gland. Where.
By what duct is the secretion discharged. Where.
What is the third salivary gland. Location.
State physical and chemical properties of saliva.
What is the estimated daily amount of saliva.
Is the action of these constant or intermittent.
State some variations in the secretions furnished.
Is the character of saliva changed by disease.
What is the nature of tartar upon teeth.
In what way are teeth affected by tartar.

